

Instructions with the Tubes.

Instructions are sent to each public vaccinator with the tubes, first, to ask only for such quantity of lymph as is immediately required; secondly, not to use lymph more than a week after it has been received, but to return it; thirdly, to keep the lymph in a cool and dark place. These instructions are designed to promote a proper care in the employment of lymph and to prevent waste.

Duration of the Activity of Glycerinated Lymph.

This depends primarily upon the quality of the lymph when collected. A first-class lymph, glycerinated and kept under suitable conditions, may retain its full activity for a year or longer, an average lymph, however, cannot be depended upon to remain fully potent longer than two months, and one of inferior quality still less. It is in this respect of range of activity that the determination of the quality of the lymph at the outset is a matter of such importance. It must be understood that the human subject is, as far as is known, the most susceptible animal to vaccinia, and that the transference of vaccine vesicles from the calf to the human subject, with or without glycerination, even if the calf vesicles are not of the first quality, will produce a human vaccinal manifestation typical in every respect, and therefore in all probability possessing full immunizing powers, provided that the calf lymph be used within its period of full activity. In calf lymphs of poor quality the duration of potency may be very short, in some cases hardly compatible with the complete effects of glycerination. Such lymphs need to be recognized at the outset and discarded.

Issue and Results.

Some of the more recent figures of the issue and results of glycerinated calf lymph prepared in these laboratories may be of interest, especially in relation to the current outbreak of small-pox. During the year ending March 31st, 1902, sufficient lymph has been issued for 974,595 vaccinations and revaccinations. The maximum amount dispatched in one week was 80,000, in the third week of January, and during the month of January 220,000 tubes were sent out. For the quarter ending December 31st, 1901, lymph was used for 261,044 cases, and showed a case success of 97.9 per cent., and an insertion success of 93.0 per cent. These cases are made up of:

	Cases.	Case Success.	Insertion Success.
		Per cent.	Per cent.
Primary ...	126,203	98.6	94.0
Revaccinations ...	134,835	97.2	92.0

SMALL-POX IN GLASGOW—1900-1902.

By J. C. McVAIL, M.D.,

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THE Medical Officer of Health of Glasgow, Dr. A. K. Chalmers, has issued a very valuable and interesting report on the recent prevalence of small-pox in that city. In noticing it we shall not attempt to touch on all the questions discussed by Dr. Chalmers, but shall refer only to certain of its more striking features.

Small-pox was introduced into Glasgow in April, 1900, and what Dr. Chalmers calls a pre-epidemic period continued until the end of that year. The total cases in this period were 397. Then, from the beginning of January, 1901, until the middle of July of the same year, there was an epidemic period in which the total cases amounted to 1,389. From the middle of July until November there was no case of small-pox in Glasgow. Next, from November, 1901, up to the beginning of May, 1902, there has been what he describes as a period of recrudescence, the total cases in this period having been 469. No doubt even since the beginning of May there have been a few cases not included in the Report, but Dr. Chalmers has done wisely in not further delaying its issue.

Recent Revaccination in Glasgow.

It is well known that in Glasgow during the period reported on there has been a very large amount of revaccination with the purpose of preventing the spread of the disease. The total population over 5 years of age is set down as 675,887, and the total revaccinations performed from the beginning of 1901 up till May 3rd, 1902, are recorded as 404,855. All but about 8,000 of these were done in the year 1901, and the rest have been done in the first four months of 1902.¹ It is obvious that these data provide with regard to the value of recent revaccination a test which has never been equalled in this country in the extent of the population dealt with in a well-defined area in a short and definite time.

The question is: What has been the influence of these 400,000 revaccinations in the prevention of small-pox? There have been two great groups of population—one the Not Recently Revaccinated, and the other the Recently Revaccinated. To avoid needless detail Dr. Chalmers takes the whole population of Glasgow over 5 years of age at the beginning of the year 1901 as not recently revaccinated. In Table VIII, quoted below, he shows in successive fortnights from January, 1901, how this population gradually diminished in amount through transference to the group of recently revaccinated, until by May 3rd, 1902, the 675,887 had been reduced to 271,032. *Pari passu* he shows how the recently revaccinated whom he regards as *nil* at the beginning of 1901 have steadily mounted fortnight by fortnight until they reach the grand total of 404,855 on May 3rd, 1902. These are the populations dealt with, and now we come to the behaviour of small-pox towards them. Here also the facts are given fortnight by fortnight. The total cases (including for convenience some children under 5) from the beginning of January, 1901, till May 3rd, 1902, were 1,858. How many of these 1,858 cases occurred in the Not Recently Revaccinated and how many, on the other hand, were found in the population recently revaccinated? In the first fortnight, when the whole population is regarded as not recently revaccinated, of course all the small-pox occurred in that group. The cases were 23. By the second fortnight 1,071 people had been revaccinated. Of 350 cases of small-pox in that fortnight, all belonged to the first or greater group, and none to the 1,071 recently revaccinated. That might be accidental owing to the smallness of the latter group. In the next fortnight the recently revaccinated population amounted to 4,862, and the small-pox cases in Glasgow were 202. None of the 202 cases occurred among the 4,862. Possibly that also might be held to be a mere coincidence. By this time revaccination was going on apace, and in the fortnight ending February 23rd the recently revaccinated population amounted to 41,674. A fortnight later it had gone up to 119,326, and in yet another fortnight to 157,461. During those six weeks the total number of cases of small-pox was 587. How many of them were among the recently revaccinated?

The answer is. Not one.

The whole 587 belonged to those who had not yet accepted the protection offered to them. Still following Dr. Chalmers's table we find that revaccination continued to spread, so that by April 6th the recently revaccinated numbered 201,193, by April 20th, 246,831; by May 4th, 291,596; by May 18th, 309,762; and by June 1st, 323,254. During this time small-pox was on the decline, the cases fortnight by fortnight being 92, 67, 28, 18, and 11, a total of 216. How many of these were among the now very large group of the recently revaccinated?

The answer again is, Not one.

From the beginning of June, 1901, onwards to the end of the year, there were very few cases of small-pox, and this fact corresponds generally with what is known of seasonal influence. The seasonal curves for London show that the first five months of the year are, outstandingly, the time for small-pox. From the beginning of June up to the middle of July there were only 11 cases in Glasgow, and these terminated the epidemic period. Once more the whole 11 belonged to the population who had not accepted revaccination. By this time that population was in a decided minority, as on July 13th the recently revaccinated numbered 394,020, and the not recently revaccinated were reduced to 218,867.

The great fact established by these very striking figures is

¹ Besides the above there were 8,001 revaccinations in 1900. *Vide infra.*

this, that during the Glasgow epidemic of small-pox in 1901, recent revaccination was an absolute protection against attack by small-pox. These two enormous groups of population in their relation to small-pox and recent revaccination teach a lesson so startlingly clear as to be utterly unmistakable in its significance. Revaccination, successfully performed on persons who are not already in the incubation stage of small-pox, may be relied on with a certainty which is practically absolute, to protect against small-pox during such an epidemic as Glasgow experienced.

The figures, however, so far as we have gone, do nothing more than this. They have not given any indication of further duration of the protection. But the lesson does not stop here. From an epidemiological point of view it is a fact of great interest that, after an interval of four months, small-pox again showed itself in Glasgow, and that the period of recrudescence has continued at least up to the beginning of May of the present year. The next question is, Did the protection afforded by the recent revaccinations of the year 1901 continue in all the cases up till the beginning of May, 1902? Or was there by that time any very early indication of drift back towards susceptibility to small-pox? Were there any individuals among the 400,000 revaccinated who, owing to personal idiosyncrasy, or to the vaccinal operation not having been sufficiently performed, or to poor quality or long keeping of lymph, or to any other such cause were attacked by small-pox? Or, on the other hand, did the whole 469 cases of small-pox which belonged to the period of recrudescence, from the beginning of November, 1901, till the beginning of May, 1902, occur among the minority of people in Glasgow who had not yet transferred themselves to the group of the recently revaccinated?

The reply to the former question is No, and to the latter Yes. Not one of the 469 cases during the period of recrudescence occurred among the recently revaccinated majority. Every one of them occurred among the not recently revaccinated minority. The former remained absolutely free not merely from death by small-pox, but even from attack by small-pox. The latter had all the attacks and all the deaths.

Not Recently Revaccinated and Recently Revaccinated Population of Glasgow over 5 Years of Age in each Fortnight, with the Cases of Small-pox occurring in each Class.

1901.		Not Recently Revaccinated.		Recently Revaccinated.	
		Population.	Cases Registered *	Population.	Cases Registered.
January	12th	675,387	23	0	0
	26th	674,810	350	1,071	0
February	9th	671,025	202	4,862	0
	23rd	634,213	127	41,674	0
March	9th	550,561	290	119,326	0
	23rd	518,426	161	157,461	0
April	6th	474,604	92	201,193	0
	20th	429,056	67	246,831	0
May	4th	384,371	28	291,516	0
	18th	366,125	18	309,762	0
June	1st	352,633	11	323,254	0
	15th	347,777	2	328,110	0
	29th	345,293	8	339,594	0
July	13th	251,867	1	339,020	0
November	16th	279,452	1	396,435	0
	30th	279,232	5	396,655	0
December	14th	279,020	4	396,867	0
	28th	278,796	0	397,091	0
1902.					
January	11th	278,623	28	397,264	0
	25th	278,152	21	397,735	0
February	8th	277,653	21	398,234	0
	22nd	277,134	147	398,733	0
March	8th	276,933	92	399,854	0
	22nd	274,611	85	401,276	0
April	5th	272,604	36	403,193	0
	19th	271,619	15	404,268	0
May	3rd	271,032	10	404,855	0

* The cases under 5 years have not been excluded from these figures, because their allocation through the various fortnights would have been difficult, and their inclusion is unimportant. In the 1900-1901 part of the outbreak these numbered 60, 54 of whom (including 30 cases occurring under 1 year) were unvaccinated primarily.

In his report Dr. Chalmers explains that the returns of re-

vaccinations were not always sent in quite regularly by the medical men. The statistics, therefore, showing the transference of population from the Not Recently Revaccinated to the Recently Revaccinated, are not to be regarded as absolutely, but only as approximately correct. If any critic of vaccination attaches importance to this, then we leave it to him to alter the figures in the population columns of the table as he pleases, provided he begins with the fact that on January 12th, 1901, the population Not Recently Vaccinated was 675,887, and that on May 3rd, 1902, it had been reduced to 271,032, while the Recently Revaccinated had increased correspondingly. If he thinks that on any particular date the population is wrongly distributed by 20,000, or 30,000, or 50,000, or 100,000, let him make the alteration to his own satisfaction, and then let him say whether the lesson taught by the table is appreciably affected. Take April 20th, for example, at which date Dr. Chalmers divides the population of 675,887 into two groups of 429,056 and 246,831. Our supposititious antivaccinationist may, if he pleases, take 100,000 off either group and add it to the other. That will not alter the essential fact that the whole 67 cases of small-pox in the preceding fortnight occurred in the first group and not one of them in the second.¹

In the presence of such facts, is it still possible to argue that vaccination does nothing to prevent small-pox? The two groups constituted the entire population over 5 years of age of the infected city—the second largest city in the United Kingdom. The offer of vaccination was free to all. In some districts small-pox prevailed more than in others, and where it prevailed vaccination was the more resorted to, so that the recently revaccinated were specially exposed to attack. The working-class population of Glasgow live in large tenement buildings of three, or four, or five flats, each flat containing several separate dwellings opening into common passages or stairways. The strongest inducement to vaccination among these was the presence of small-pox in their midst. Some accepted the offer and some declined it. Fortnight after fortnight from the beginning of January, 1901, till the beginning of May, 1902, the experiment was repeated of allowing small-pox to differentiate between the Recently Revaccinated and the Not Recently Revaccinated. At the end of each fortnight the grouping was changed, a constant addition being made to the Recently Revaccinated, and a constant diminution taking place in the Not Recently Revaccinated. Whatever the numbers were in the two groups, the behaviour of small-pox with regard to them never varied, in respect that it persistently picked all its victims from the Not Recently Revaccinated, and as persistently refused to have anything to do with the Recently Revaccinated. To begin with, the opportunity of small-pox to attack the Recently Revaccinated was small. At the end of the first four weeks they numbered only 1,071. Four weeks later they had increased to 41,674, but small-pox still left them alone. In another four weeks a field of Recently Revaccinated, amounting to 157,461 persons, was spread out before small-pox but it refused to enter. In four weeks more the numbers were 246,831, but small-pox was not to be tempted. By February 22nd, 1902, the Recently Revaccinated had mounted up to nearly 400,000, and the other group had shrunk to less than 280,000. In the fortnight ending on that date small-pox had attacked 147 persons, but not one of these belonged to the 400,000, every case being taken from the reduced ranks of the Not Recently Revaccinated. As in Egypt long ago the angel of death passed by the houses of the Israelites whose lintels and door-posts were sprinkled with blood; so in Glasgow small-pox passed by those who had recently submitted to what antivaccinationists sneer at as the rite of vaccination. Wealth or poverty, cleanliness or dirt, drunkenness or total abstinence, youth or age made no difference to the Recently Revaccinated so far as small-pox was concerned. They remained immune right from the beginning of the epidemic to the end. The people lived together in these great tenements, subject to the same sanitary or insanitary conditions of water supply and drainage and refuse removal and house accommodation, their children attending the same schools, and themselves engaged in the same occupations. They differed only in this one respect—

¹ Also to avoid quibbling, he may, if he pleases, deduct from the total cases in the table a hundred or two to represent children under 5 years of age.

that some had submitted to revaccination and others had refused. Small-pox left the former class absolutely unscathed and found all its victims among the latter.

Having shown that recent revaccination did protect perfectly, both throughout the epidemic and throughout the period of recrudescence, we have now to ask whether the Glasgow epidemic furnishes any further evidence as to the duration of protection of revaccination. An answer is, so far, to be found in the fact that during the year 1900, in Dr. Chalmers's pre-epidemic period and prior to that covered by the table already quoted, there were 8,001 revaccinations performed in Glasgow. These remained entirely free from small-pox both in the epidemic of 1901 and in the period of recrudescence in 1902.

Still further evidence is afforded by such small-pox as did occur among those who had been revaccinated in Glasgow in periods earlier than the year 1900. During the epidemic of 1901 and the recrudescence of 1902, there were among the 2,255 persons attacked by small-pox, 19 who had been successfully revaccinated at some time or other prior to infection. The number of years which had elapsed between revaccination and attack by small-pox was as follows in these cases respectively: 55, 40, 32, 32, 31, 28, 27, 26, 21, 12, 11, 9, 8, 7, 6, 4, 4, 3, and 3. No particulars are given of the character of the scars left by these revaccinations, and it is unfortunate that no exact information is obtainable as to the total number of the population of Glasgow revaccinated prior to the year 1900 who contributed these 19 cases to the 2,255 cases constituting the epidemic. But it is well known that Glasgow is a city in which there has been much revaccination for many years. Opponents of vaccination, in referring to the recent outbreak, are never tired of quoting Dr. Russell's statement, made in 1897, that in Glasgow there had been "vaccination and revaccination to an extent unparalleled in any other locality." These 19 cases, however, were all that this revaccinated population of Glasgow contributed to the small-pox epidemic, and had the whole city been revaccinated there would have been no opportunity for the spread of small-pox in epidemic fashion.

Vaccination during the Small-pox Incubation Period.

Another question of interest is, In how many cases did small-pox develop within a fortnight of vaccination, the person being already infected by the disease before the protective operation was performed? The total was 126. In 6 of these the operation was not performed until the very day on which the individual sickened with small-pox; in 11 there was an interval of one day; in 3 an interval of two days; in 7 of three days; in 20 of four days; in 17 of five days; in 6 of six days; in 11 of seven days; in 13 of eight days; in 4 of nine days; in 1 of ten days; in 1 of twelve days; and in 1 of thirteen days. It thus appears that in all but 7 of the 126 cases the interval was eight days or less. The fact that these 7 were all that were to be found in a recently revaccinated population of over 400,000 is strongly indicative of the power of vaccination in very many cases to overtake or overcome small-pox if the operation is performed within a very few days after exposure to infection.

The Lymph used in Glasgow.

The Report gives no information regarding the brands of vaccine lymph that were used for the 400,000 revaccinations. Speaking roughly, lymph for about 350,000 of the 400,000 was supplied by the Corporation of Glasgow, the rest being obtained by medical men on their own account. We understand that it was all glycerinated calf lymph, and that it was not all supplied by any one maker or firm. The efficacy of these lymphs in preventing small-pox in Glasgow is certainly very strong evidence of the sound commercial morality and general reliability of private makers of vaccine lymph, and we are very glad to publish this fact. Nevertheless, we do not for one moment withdraw our opinion so frequently urged that all manufacture of vaccine lymph should be carried on under Government supervision. It is important not merely that lymph should be active, but also that it should be as free as possible from extraneous organisms, so that bad arms may be as few as possible.

Efficient Vaccination.

Nor does the Report give any information as to the number of marks or the insertion area of the 400,000 revaccinations.

The opportunity to revaccinate on behalf of the local authority was offered to every medical man in Glasgow, and was accepted by a very large number. Whatever was the practice with regard to thoroughness of operative procedure, the results were sufficient to carry the protected individuals safely through the epidemic and its recrudescence. But it is generally understood that in Scotland the average standard of area and number of marks is not so high as in England, and this suspicion is supported by one fact mentioned in the Report. In January, 1901, when there was occasion, owing to the growth of the epidemic, to issue a second circular to practitioners asking co-operation in revaccination, the age-limit was reduced to 5 years "because of the number of children admitted [to hospital] with trifling vaccination cicatrices." While Scotland, therefore, is much in advance of England with regard to the numbers primarily vaccinated in proportion to the children born, in the important matter of efficiency of vaccination, as represented by area and number of marks, it is probably considerably behind England. If this be so, then there may well be an earlier average return of susceptibility to attack by small-pox in Scotland than in England, and it is fortunate that when small-pox does appear in Scotland, or at least when it seriously threatens a community, there is so very extensive a resort to the protection of revaccination.

We have already occupied so much space over this part of Dr. Chalmers's Report that it is impossible to do more than glance at the rest of it.

The Influence of Insanitation.

The question of the influence of insanitation in spreading small-pox in Glasgow is dealt with in the Report. For statistical purposes, Glasgow is divided into 34 districts. The general death-rate in Glasgow in 1898-1900 was 20.6 per thousand per annum. The following table gives the small-pox attack-rate in the six districts with the highest general death-rate, and also gives the general death-rates in the Eastern Division of the city in which small-pox mostly prevailed.

District.	Deaths per 1000 from all Causes.	Small-pox Attack-rate per 1000.
13 Brownfield	33.06	2.5
16 Cowcaddens	32.79	1.0
6 High Street and Cluses East ...	30.43	2.9
2 Port Dundas	29.55	0.3
22 Gorbals	28.89	1.8
3 High Street and Cluses West ...	28.62	0.3
Glasgow	20.6	2.3
<i>Eastern Division.</i>		
7 Greenhead and London Road ...	22.0	9.9
8 Barrowfield	25.7	6.4
5 Bellgrove and Dennistoun ...	19.0	2.8

Another table gives for these same districts the infantile, the zymotic, and the respiratory death-rates, as follows:

District.	Death-rate under One Year for 1,000 Born.	Death-rate per Million.		
		Zymotic Diseases.	Respiratory Diseases (not Phthisis).	Small-pox.
13 Brownfield	207	5,303	8,934	—
16 Cowcaddens	218	5,033	9,379	220
6 High Street and Cluses East ...	198	3,839	5,394	282
2 Port Dundas	224	4,288	8,150	—
22 Gorbals	209	4,768	7,487	153
3 High Street and Cluses West ...	177	3,262	6,597	103
City	153	3,153	4,617	307
7 Greenhead and London Road ...	152	4,319	4,826	1,103
8 Barrowfield	180	4,813	6,510	939
5 Bellgrove and Dennistoun ...	142	3,185	4,104	442

These figures, so far as they go, give no support to the view

that small-pox selected the most insanitary districts for its field of operation in Glasgow.

Hospital Statistics.

Referring now to experience of small-pox and vaccination in Belvidere Hospital, Dr. Chalmers's Table VI teaches the

TABLE VI.—Glasgow.—Small-pox, 1900-1.—Return as to Vaccination of All Cases Treated in Belvidere Small-pox Hospital from April 1st, 1900, to June 30th, 1901.

Age.	Vaccinated.			Unvaccinated.			Vaccination Doubtful.			Total.		
	Recovered.	Died.	Mortality per cent.	Recovered.	Died.	Mortality per cent.	Recovered.	Died.	Mortality per cent.	Recovered.	Died.	Mortality per cent.
Years.												
0-5 ...	2	1	33.3	18	36	66.6	3	—	—	23	37	61.7
5-10 ...	31	—	—	10	2	16.7	2	—	—	43	2	4.4
10-15 ...	92	1	1.1	10	4	28.6	1	—	—	103	6	5.5
15-20 ...	131	—	—	4	2	33.3	1	—	—	136	3	2.2
20-25 ...	242	12	4.7	2	4	66.6	1	2	66.6	245	18	6.8
25-35 ...	584	42	6.7	6	5	45.8	4	9	69.2	594	56	8.6
35-45 ...	291	51	14.9	8	4	33.3	5	6	54.5	304	61	16.7
45-55 ...	91	26	22.2	1	6	85.7	3	4	57.1	95	36	27.5
55-65 ...	18	13	41.9	—	—	—	1	1	50.0	19	14	42.4
65 and over	10	4	28.6	—	—	—	1	1	100.0	10	5	33.3
All ages ...	1,492	150	9.1	59	63	51.6	21	25	54.3	1,572	238	13.1

This table includes cases from beyond city boundaries.

usual lessons (1) that small-pox among the vaccinated is now adays mainly a disease of adults, because children are protected by primary vaccination, and renewal of protection is greatly neglected; (2) that among the unvaccinated small-pox is still in great measure a disease of the young as it was in pre-vaccination times; and (3) that the fatality-rate among the vaccinated is at all ages much less than among the unvaccinated, and that this difference is more striking in children because of the recency of their vaccination. It will be observed from the table that two deaths occurred among 258 vaccinated persons under 20 years of age. One of these two was between 10 and 15 years old. The other was a child of 2 years old, "whose vaccination mark was .04 of a square inch in area and was glazed and not foveated."

The Scottish Vaccination Act of 1863 came into force in 1864. In Glasgow there was an epidemic in 1855-57. At that time 88.8 of the small-pox deaths occurred in children under 10 years old, and only 11.2 per cent. in persons over that age. Then Glasgow in 1870-72 had its share of the pandemic of the early Seventies. By that time the Vaccination Act had had from 6 to 8 years in which to protect children born since 1863, and the percentage of the total small-pox deaths contributed by children under 10 years of age was reduced from the 88.8 per cent. of 1855-57 to 38.5 per cent. in 1870-72. For many years the amount of default of primary vaccination in Glasgow has averaged only about 3 per cent., so that the recent epidemic found the great bulk of the youthful population primarily vaccinated. That being so, the children under 10 years of age, who contributed 88.8 per cent. of the total small-pox deaths in the first of these three epidemics, and 38.5 per cent. in the second epidemic, have now (in 1900-1) contributed only 16.4 per cent., no less than 83.4 per cent. of the cases being over 10 years old. There can be no doubt whatever that if the average efficiency of primary vaccination in Glasgow, as represented by number and area of marks, had been as high as it ought to be, the contribution made by children under 10 would have been a good deal less than even 16.4 per cent.

Hospital Influence.

An important question which we can do no more than mention here is that of hospital influence in the spread of small-pox in Glasgow. In the epidemic of 1870-2 Glasgow treated its small-pox in Parliamentary Road Hospital, and at that time there was a great aggregation of cases of the disease in the population surrounding that institution. Belvidere Hospital, where the disease has been treated in recent years, is in the east end of the city, and the eastern division has had

very much more than its share of small-pox cases. There can be no doubt that this adds another to the many well-known examples of the influence of small-pox hospitals in spreading the disease in the surrounding population. The Corporation of Glasgow will, it may be assumed, give very serious consideration to the evidence adduced by Dr. Chalmers on the evil effects of Belvidere Hospital during the late epidemic. What remedy they may ultimately adopt, we know not. Meantime, however, we would desire to point out this to them. Among the 400,000 persons recently revaccinated there was not a single case of small-pox. If the remaining portion of the city had been similarly protected there would have been no case of small-pox in Belvidere, and not a single hospital bed would have been required for the treatment of that disease. This does not mean that all the 270,000 of population over 5 years old not recently revaccinated should have been revaccinated at the time of the epidemic. Of the total census population 79,821 were between 5 and 10 years old. If primary vaccination were done as efficiently in Glasgow as it ought to be done, these would be excluded from any need for revaccination, and this would make a reduction of the 270,000 population in question to about 190,000. Very many of these had already been revaccinated at some time or other, and we have seen that they contributed only 19 cases to the epidemic. In short, if all had been revaccinated only once in their lives there would have been no epidemic. As it is, those who have taken the trouble to protect themselves have also had to contribute their full share to the Belvidere Hospital expenses, and if new hospitals are to be built they will be similarly mulcted.

Very soon the subject of vaccinal legislation in England must again come before Parliament. If Glasgow wants to get rid finally of all the worry and of very nearly all the expense of small-pox hospitals, it should urge its representatives in Parliament to support the policy of getting revaccination at adolescence put on the same legislative footing as primary vaccination of infants, so that exactly the same pressure may be brought to bear on revaccination of children about to leave school as on the vaccination of infants within six months of their birth.

VACCINATION WITH GLYCERINATED CALF LYMPH.

By ALBERT E. COPE, M.D. DURH., M.B. LOND., D.P.H.

WHILE it may be given to few to explore the pathology and bacteriology of small-pox and vaccination, or to investigate their history and statistical relations, there are two questions of the utmost practical importance, and of very general interest, which recent legislation has brought into prominent relief. What method should we adopt, and what results may we observe, in the employment of glycerinated calf lymph for human vaccination and revaccination?

The Vaccination Order of 1898 has wisely contented itself with laying down certain general principles, leaving it to the initiative of each vaccinator to apply them. Thus the public vaccinator is instructed that "Vaccination should at every stage be carried out with aseptic precautions. These should include (1) the cleansing of the surface of the skin before vaccination; (2) the use of sterilized instruments; and (3) the protection of the vaccinated surface against extraneous infection both at the performance of the operation and on inspection of the results."

It will be my object to briefly outline some of the methods which may be adopted, and some of the results which may be observed, in the hope that others may be stimulated to give the benefit of their experience, and that an increasing simplicity in our methods may yield more uniformity in our results.

We will suppose then that a child is before us for vaccination. Our first duty is to assure ourselves that the child is fit to be vaccinated. Generally speaking the mother will be quick to let us know of any abnormal condition; but it is none the less important to confirm our general impression of the well-being of the child by an examination of the skin, especially behind the ears and in the napkin area, for evidences